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THE EFFECT OF FOUR COMPONENTS OF BEHAVIORAL OBJECTIVES ON RATERS' PERCEPTIONS

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Rule Learning and Systematic Instruction in
Undergraduate Pilot Training

Vernon S. Gerlach, Principal Investigator

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I. Problem

For the past decade, behavioral objectives have been widely used by instructional designers, researchers, evaluators, and curriculum designers for systematic planning and assessment in education. Most advocates of behavioral objectives agree that all adequate behavioral objectives must contain three basic components: (1) the verb, which states what the learner will be able to do after the learning experience (e.g., to measure); (2) the condition of performance, which states the circumstances under which the action occurs (e.g., given a ruler); and (3) the criterion, which states the standard of performance (e.g., to the nearest quarter of an inch). Although there is general agreement at the conceptual level as to what constitutes an adequate behavioral objective, little has been done in the way of empirical research to develop an operational definition of the concept. Furthermore, there has been little research to determine the variables that govern the efficacy of behavioral objectives. One result of this situation seems to be that many individuals act as if any explicit statement of outcomes will serve as an adequate behavioral objective. Consequently, behavioral objectives exhibit a wide variety of characteristics, characteristics which on occasion bring into question the appropriateness of the label "behavioral."

In the past, both research and development efforts on objectives have focused on the role of the verb, to the exclusion of the other two characteristics. This emphasis seems to have been based on the assumption that the verb is the primary, if not the sole, determiner of the degree to which an objective may be considered behavioral, since it is the verb that represents what the person "does." In one important study, Deno and Jenkins (1969) had 14 in-service educators rate 99 verbs on a five-point rating scale of observability. These 99 verbs were selected from a

well-known experimental curriculum. The results indicated that many widely used and highly recommended behavioral terms refer to behavior not perceived by educators to be clearly observable. Deno and Jenkins concluded that verbs used in behavioral objectives are selected for consistency of usage rather than for maximum observability. This and the scattering of other empirical studies on the role of the verb in behavioral objectives have been summarized by MacDonald-Ross (1973).

The study reported here is one of a continuing series of studies analyzing raters' perceptions of the components of behavioral objectives, rated both in isolation and within complete statements of objectives. Since these studies have enabled the investigators to assess the degree to which the various components contribute to the raters' perceptions of the com objective, they provide a step toward an operational definition of t ehavioral objective.

In the first study of this series, Gerlach (1974) replicated the Deno and Jenkins study by having 35 seniors and first-year graduate students in an Education course at the University of Minnesota rate the same 99 verbs on a scale from most observable (1) to least observable (5). Results were essentially the same as those obtained by Deno and Jenkins, with a correlation between the two sets of ratings of +.90.

Both the Deno and Jenkins and the Gerlach studies assessed the influence of only one component, the verb, rated in isolation. The next logical step was to explore whether or not statements of conditions and of criteria would influence individuals' perceptions of the observability of behavioral objectives based on a given verb. For example, if a verb that has a low observability rating when rated in isolation is used in an

objective, will that objective receive a higher rating if the objective includes highly precise, observable statements of condition and/or criterion?

Gerlach and Barron (1974) pursued this line of inquiry in a study designed to assess the roles of the three basic components of an objective, rated in isolation as well as in complete statements containing all the components. The results confirmed the importance of the verb in the perception of objectives, but they also provided evidence that the choice of condition and criterion influences the rating of the complete objective. In an extension of this study, Barron and Gerlach (1975) used four different rating scales (observable-nonobservable, precise-vague, clear-unclear, and concrete-abstract) to examine the differences among rating dimensions. The results confirmed the importance of conditions and criteria in determining the overall objective rating. In addition, the four rating scales were highly intercorrelated, suggesting that they can be used almost interchangeably.

In a multiple correlation analysis of the Barron and Gerlach (1975) data, it was found that a substantial portion of the variance of ratings of total objectives could be accounted for by a linear combination of the three component parts, verb, condition, and criterion. The variance unaccounted for was a nagging concern, however, and led to a reanalysis of the problem. In the reanalysis, it became clear that the role of the direct object was being ignored. Up to this point, all studies had used "x" and "y" inserted where the direct object would normally go, e.g., "to draw x accurately from memory." This was done to avoid interference from choice of specific subject matter; in many practical cases, the direct object constitutes a "given" that is ordinarily not subject to variation by the instructional designer. To the degree that subjects mentally inserted

their own choice of direct object, the overall rating may have been affected. For example, a subject who thinks in terms of fairly concrete objects such as "a square" might rate the overall objective as much more precise and observable than one who mentally inserts the word "something." Furthermore, it seemed possible that the use of the unspecified, abstract letters as direct objects might have caused a general shift toward perception of objectives as less observable or less precise. For these reasons, it seemed desirable to determine the strength of association between the choice of direct object and the overall rating of the complete objective.

The present study was designed to explore the role of the direct object in the perception of the complete behavioral objective. The study was designed to answer the following specific questions:

(1) Does the inclusion of direct objects, as opposed to abstract direct objects (i.e., "x" or "y"), in statements of behavioral objectives generate an overall shift of ratings in the direction of increased observability and precision?

(2) Do the ratings of individual objectives change as a result of the choice of different direct objects?

Since it could be argued that a positive answer to the second question would cloud the interpretation of a positive answer to the first, the lists used were balanced by selecting direct objects that covered a wide range of observability. In this way, it was hoped to avoid the objection that any overall shift was caused by using highly observable direct objects throughout.

II. Method

Subjects and Design

Sixty-four undergraduate students from two upper division instructional media courses participated in this study as part of their regular

class sessions. Four additional students omitted items from their response booklets, rendering these booklets useless; their data were excluded from the study.

Forty-four of these subjects served in the main design of the study. Each of these subjects rated 24 objective statements containing 24 different direct objects. Each subject also rated the 24 direct objects in isolation for purposes of comparison. The 24 objects were organized into six objective sets of four objectives each. Within each set, the verb, condition, and criterion were identical, so that the four objectives varied only in choice of direct object. Different sets used different verbs, conditions, and criteria, and no component of an objective was used in two different objective sets. The arrangement of components is shown in Table 1, from which the entire set of 24 objectives can be reconstructed. The experimental design was a repeated measures nested design, with six objective sets and (four different) direct objects nested within objective sets. This design was replicated with two rating dimensions, observability and precision; 22 subjects were used for each rating dimension. The ratings of direct objects in isolation were collected for the purpose of determining the correlation between direct objects and complete objectives containing those direct objects.

In addition to the main design, 20 additional subjects rated six complete objectives containing "x" or "y" in place of the direct object. These six objectives corresponded to the six objective sets used in the main design. These ratings were collected to compare overall ratings with and without explicit direct objects. Again, half the subjects rated observability and half precision.

Table 1

Components of the Six Objective Sets

Verb	Condition	Criterion	Direct Object
1. To draw	from memory	accurately	simple floor plans... conclusions... a graph... organizational charts...
2. To identify	given various chances	appropriately	pictures of instruments... factors influencing... stated and unstated assumptions... cause and effect relationships...
3. To use	given the choice of doing so or not	frequently	syllabication... percent to solve... school and public libraries... a desk calculator...
4. To recognize	given no help	on the first attempt	errors in logic... interrelationships... the tentativeness of conclusions... evasiveness...
5. To know	given five attempts	with 30 minutes	scientific terms... law of operation... the political structure... the function of officers...
6. To understand	given audible encouragement	without error	computer processes... nature of a scientific... costs of education... idiomatic expressions...

Materials and Procedure

Subjects in the main design each received a booklet containing four pages of complete objectives, six to a page. On each page, one objective from each objective set appeared. A fifth page contained the 24 direct objects to be rated in isolation. The rating scale to be used was printed at the top of each page in the booklet, in a diagram depicting the full range of the scale, most observable (1) to least observable (5) or precise (1) to vague (5). The same rating dimension was used throughout each booklet. Subjects recorded their responses directly in the booklets. The booklets were assembled in counterbalanced order, to avoid order effects, and were stapled to a cover page which provided instructions and two sample ratings.*

For the 20 subjects rating objectives without direct objects, the six objectives to be rated were all on a single page; the same cover sheet was used for these booklets.

The 24 direct objects used in this study were selected from objectives developed by the National Assessment Project (1972). The pool of direct objects was rated a priori by the experimenters for observability and precision; the final 24 selected provided a wide range of values within each objective set. The six verbs used (cf. Table 1) were selected from a pool of verbs that are not domain specific, and for which earlier studies had provided data concerning the perceived observability, both in isolation and in context. They were chosen so that the mean ratings covered the

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*All subjects also rated 25 verbs, 25 conditions, and 25 criteria as part of a replication of previous work. The results from these ratings generally confirm previous results, and they will not be discussed further in this report.

entire spectrum of the observability scale. The conditions and criteria were chosen in similar fashion. The components were combined into objectives in such a way as to avoid absurdities, and to be consistent with generally accepted grammatical and contextual conventions.

The subjects were given oral and written instructions by the experimenter at the outset, along with the examples explaining the method of rating. Specific reference was made in the instructions to the fact that these statements are typical of expressions used in instructional objectives. The subjects were also instructed not to refer back to a page once it had been completed.

III. Results

The means and standard deviations for objective sets, with and without direct objects, are shown in Table 2 separately for each rating dimension. It is readily apparent that there is no significant difference between subjects' ratings of objectives with direct objects and objectives containing "x" and "y". This is reflected in tests computed separately for observability, $\underline{t}_{(30)} = .60$, and precision, $\underline{t}_{(30)} = 1.18$.

Turning to the question of differences induced by choice of direct object, an analysis of variance was computed separately for each of the two rating dimensions; this was done for purposes of both simplicity and clarity. The results of the two analyses are shown in Tables 3 and 4. As expected, since an effort had been made to construct objective sets differing in ratings, the mean ratings for verb sets differed significantly; in the observability analysis, the most observable objective was "to accurately draw a graph from memory" and the least observable objective was "to understand computer processes without error, given audible encouragement"; in the

Table 2

Means and Standard Deviations for Objective Sets

	Observability			Precision		
	$\bar{X}$	S	N	$\bar{X}$	S	N
Objectives containing x and y in place of direct objects	3.012	.4754	10	3.046	.6164	10
Objectives with direct objects	2.890	.5385	22	2.760	.6132	22

Table 3

Analysis of Variance Summary Table for Observability

Source	SS	df	MS	F
Subjects	145.9773	21	6.951	
Verb Sets	119.197	5	23.839	10.502*
Direct Objects within Verb Sets	40.8636	18	2.270	2.4059*
Subjects by Verb Sets	303.3863	105	2.8894	
Residual	356.6364	378	.9435	
TOTAL	966.0606			

*$p < .01$

Table 4

Analysis of Variance Summary Table for Precision

Source	SS	df	MS	F
Subjects	189.3106	21	9.0148	
Verb Sets	47.3333	5	9.4666	5.28*
Direct Objects within Verb Sets	32.2955	18	1.7942	2.27*
Subjects by Verb Sets	261.6667	105	2.4921	
Residual	299.2045	378	.7915	
TOTAL	829.8106			

*$p < .01$

precision analysis, the most precise objective was "to draw simple floor plans of furnishings in rooms, from memory" and the least precise was "to appropriately identify stated and unstated assumptions, given various chances." More important was the question of whether the direct objects caused significant differences within objective sets, that is, whether the four objectives within objective sets differed. The results are clear for both rating dimensions. The objectives within sets differ significantly more than would be expected by chance; for observability, $F_{(18,378)} = 2.41$, $p < .01$; for precision, $F_{(18,378)} = 2.27$, $p < .01$. This finding is further bolstered by the correlations between ratings of direct objects and ratings of objectives containing those direct objects, computed within sets and averaged: +.78 for observability ratings and +.41 for precision (p's < .05).

IV. Discussion

The results indicate clearly that the choice of direct object does influence raters' perceptions of the observability and precision of a behavioral objective. Taken together with the results of Barron and Gerlach (1975), these results provide convincing evidence that no single component, such as the verb, should be singled out as being of primary importance in determining the character of a behavioral objective. Rather, careful attention must be paid to all components to insure an objective that is observable, precise, clear, and concrete. This conclusion must be tempered by the realization that the instructional designer does not have complete freedom in selecting direct objects. Instead, they are often specified by the user organization as part of the instructional goal. For example, if the aim is to teach the student to multiply fractions, there is little opportunity to substitute another direct object. However, once alerted to the problem, the instructional designer will have no difficulty, having recognized the

inherent imprecision of asking the child to "draw a nice picture," in seeking a more precise, observable direct object.

The absence of a pronounced shift toward greater observability and precision for objectives containing direct objects suggests that subjects either (1) substitute mentally their own direct objects, which average out to about the same values as real direct objects, and/or (2) ignore the "x" as an active element in the objective when they have not been exposed to other sentences containing real direct objects. Regardless of the interpretation, the lack of a radical shift lends increased confidence in results obtained in previous studies employing only "x" and "y" in objectives.

The empirical data gathered in this study on the ratings of the components of a behavioral objective in isolation and within complete statements of objectives indicate that the selection of the various components influences individuals' perceptions of objectives. The data suggest that the investigators are moving closer towards a consistent operational definition of the behavioral objective. As the function of the individual components becomes more clearly delineated, the future research in this area will explore how this type of information can assist educators and trainers to select and to construct more precise statements of behavioral objectives.

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The structure and characteristics of behavioral objectives were investigated. College students' perceptions of the precision or observability of statements of behavioral objectives and of three components (the verb, the condition(s), and the criterion) of such statements were assessed. The results of a correlational analysis indicate that conditions and criteria contribute significantly to individuals' perceptions of objectives, in

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contrast to findings of earlier studies. The study provides evidence that instructional designers, researchers, and evaluators must be concerned not only with the verb in a behavioral objective, but also with the choice of conditions and criteria.